

PROCEEDINGS  
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A NEW BULLFROG (*RANA HECKSCHERI*) FROM  
GEORGIA AND FLORIDA.<sup>1</sup>

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In 1902 Dr. Leonhard Stejneger described *Rana grylio*, "A New Species of Bullfrog from Florida and the Gulf Coast" (U. S. Nat. Mus. Vol. XXIV, No. 1252, pp. 211-215). These southern bullfrogs, or "Joe Browns" are very distinct in adult, tadpole and egg characters from the bullfrog, *Rana catesbeiana*. In the last ten years, evidence in the Okefinokee swamp region has presented enough material to warrant our description of a third bullfrog, *Rana heckscheri* from Georgia and Florida. It is as distinct if not more so than *Rana grylio*. In tadpoles, voice and adult characters it is clearly a new species. We have not the egg characters.

Narrative:—

On June 16, 1912, at the Fargo (Ga.) heronry amongst a swampy tangle of buttonbush (*Cephalanthus occidentalis*), "hurrah bushes" (*Leucothoe racemosa*) and "lather leaf" (*Clethra alnifolia*) the author found some black tadpoles with yellowish white crossbands and surmised that they were the tadpoles of *R. grylio*. That was a mistake. On the western edge of swamp on the day of our first entrance in 1912 we secured an adult frog which puzzled us. We saw it only for a few moments. We soon lost it in the rigors of the trip. It was a fine male of *R. heckscheri*.

In 1921 when I returned from the swamp three tadpoles were

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In the summer of 1921 Mr. Francis Harper assisted in the field work of this study and in the summer of 1922, Mrs. A. H. (Anna Allen) Wright, Mr. Francis Harper and Mr. Miles D. Pirnie gave valuable assistance to the author in this same series of studies.

referred to me from the U. S. Bureau of Fisheries. They were unlike anything we had seen before. Our reply was solely as to the identity of the material. The correspondent, a doctor from Savannah, Georgia, was concerned to know if albinism was common in tadpoles. Some of them were albinos and some normal. A week or so later, Aug. 7, 1921, Mr. Francis Harper and Marion Lee found a small tadpole in the St. Mary's river, Baker county, Florida, about 10 miles south of Moniac, Georgia. On Aug. 16, 1921, at Camp Pinckney (3 mi. E SE of Folkston, Ga.) St. Mary's River, they secured three more larger tadpoles. These and the Savannah tadpoles were at hand when we surmised they might be gopher frog (*R. aesopus*) or sphagnum frog (*R. virgatipes*) tadpoles. They are of neither species.

In 1922 on July 17 at Thompson landing (south of Folkston) St. Mary's River in a cut-off overflow pool we found the water almost a pure culture of a small black tadpole with a gold and white transverse band like those of June 16, 1912. My journal reads thus:

"In one cut off pool in a water course (which now is a succession of separated pools) we hauled the seine. It was covered with a wriggly mass which at first looked like water beetles to Miles (Mr. M. D. Pirnie). I must confess I would have seen them the same way if I had seen them before. The tails are transparent and were hardly in evidence. They have a band across the back. In another cut-off from the river proper (St. Mary's River) in shallow water they were in immense numbers and presented a very beautiful sight in sunlit situations with their dark bodies and transverse bands. Were it not for the transverse bands, they would look like toad tadpoles. Then I provisionally placed them with the green tree-frog, *Hyla cinerea*, which sometimes has somewhat of the same appearance."

Three days later, July 20, we started for Jacksonville, Florida.

"At Callahan, Florida, (just north) near a large concrete bridge for the Dixie highway, a car was stuck on the smaller bridge to the west in the detour and we had to wait. In the areas beside the new Dixie highway were shallow ponds or overflow areas. These were tributary to Alligator Swamp which in turn is a part of Mills Swamp (U. S. Geol. Survey Sheet, Hilliard). At first I saw a few cross-banded forms of the Thompson's landing sort which I took to be *Hyla cinerea*. Now I

suspect they are probably *R. aesopus* or *R. virgatipes*, probably the former. We collected a few and went on. They are very conspicuous with black-rimmed crests and black bands on upper half of tail musculature and a light color on lower musculature. In one-third grown ones the cross bands show through faintly. When half grown it disappears.”

On July 21, on our return from Jacksonville “we stopped at Callahan (Alligator Swamp). The tadpoles of July 20 were abundant. They travel in big schools as no other big tadpoles do. They remind me of a school of mature *Bufo* tadpoles. Once in a while amongst the fair-sized ones were monsters almost as big as a bullfrog tadpole. And these monsters have no suggestion of hind-leg buds. Does this species winter over one or two years as a tadpole.”

We checked up our Thompson Landing (Ga.) and Alligator Swamp (Fla.) material and found them all of the same species. We later found they could not be tadpoles of *Rana aesopus* or *Rana virgatipes*.

A month later, Aug. 18, 1922, we visited this place at night. Mrs. Wright discovered a queer looking green frog as she supposed and as she was calling to us we were startled by a call unlike any other *Rana* we ever had heard. To one it was a snore, to another a snort, and to others neither. The queer green frog and the author of the call proved of the same species and not green frogs of which we captured some for comparison. “With a light we captured eight or ten frogs of various sizes from probable one-year frogs to full-sized adults. We found them in shrubbery and on the banks about the bases of trees. More were captured than lost. They were rather awkward in their escape and would tumble off from their perches. Later in the evening we lost all but three of our captures.”

Mr. Francis Harper while traveling down the St. Mary's river in August, 1921 “heard a number of times, in addition to the regular snoring call, a peculiar explosive snarling grunt.” Then he associated it with *Rana aesopus* but now he believes it this species.

***Rana heckscheri*, new species.**

*Diagnosis*.—Like *Rana grylio* and *Rana catesbeiana*, it has no dorso-lateral fold and no phalanx of the fourth toe is totally free of web; third toe in 56 mm. specimens 1 to 3 mm. shorter in *Rana heckscheri* than in the

other two species of bullfrog or 3 to 6 mm. shorter in 82 mm. specimens or 6 to 9 mm. shorter in 95 mm. specimens; third toe 3.8 (95 mm.)–3.56 (82 mm.)–3.3 (56 mm.) in length (snout to vent) in *R. heckscheri* while 2.7 to 3.1 (95–56 mm.) in *R. grylio* and *R. catesbeiana*; third toe 1.6–1.7 in fourth toe in *R. heckscheri* while 1.2–1.5 in fourth toe in the other two species; first finger decidedly longer than second, while in the other two species it is usually shorter or sometimes equal; first, second, third and fifth toes shorter than corresponding toes of *R. grylio* and *R. catesbeiana*; fourth finger 8.6 (95 mm.)–8.2 (82 mm.)–8.0 (56 mm.) in length (snout to vent) while 6.0 to 6.3 (95 mm.)–6.8 to 7.4 (82 mm.)–5.6 to 7.1 (56 mm.) in the other two species; internasal space less than upper eyelid width, 1.07–1.43 in it while .85–1.0 in *R. grylio* and *R. catesbeiana*; tympanum in males is proportionally greatest in *R. grylio*, somewhat smaller in *R. catesbeiana* and *R. clamitans* and smallest in *R. heckscheri*; intertympanic width of 95 mm. males in length (snout to vent) 4.52 in *R. heckscheri*, 5.43 in *R. clamitans* and 6.3 in *R. grylio* (*R. catesbeiana* males of 95 mm. have tympanum poorly developed, but a 136 mm. male has it 4.85): in general, intertympanic width broadest in *R. heckscheri* and *R. catesbeiana* and narrowest in *R. grylio*; distance from the rear corner of the eye to the same corner of the other eye much greater than the intertympanic width in *R. grylio*, somewhat greater in *R. clamitans*, about equal in *R. catesbeiana* and equal in *R. heckscheri*, i. e., in the males.

In spirits, four 95 mm. males of four species are as follows: bister or mummy brown on dorsum of *R. catesbeiana*, brownish olive in *R. grylio*, deep grayish olive in *R. clamitans*, and deep mouse gray in *R. heckscheri*; upper parts without very distinct dark spots in *R. clamitans* and *R. catesbeiana*, with prominent large black spots in *R. grylio*, and with many small dark spots in *R. heckscheri*; venter of *R. clamitans* clear white except for the yellow throat, venter of *R. catesbeiana* heavily blotched with black, so also in *R. grylio*—all three, however, with a white background color but in *R. heckscheri* the deep mouse gray or dark color so prominent it becomes the background color and the white, scattering spots; light spots on upper and lower jaws more prominent than in *R. clamitans*.

*Coloration in life.*—Adult male (95 mm.) (Aug. 18, 1922). General dorsal color citrine drab to grayish olive becoming on top and sides of head and center of tympanum dark olive buff, isabella color or cinnamon brown. Ear drum except middle mummy brown. On back of body and on head and on some of the sides is some serpentine green. Under parts spotted white and glaucous gray or light payne's gray or pale drab gray on throat and breast. Throat with a little citron green or deep chrysolite green. Spots on lower jaw rim four or five, seafoam yellow to deep colonial buff in the spot just back of the angle of the mouth. This spot except above surrounded by black.

Black spot just below angle of mouth to and across the insertion of the brachium. Three black spots on the front edge of the antibrachium. Rear of fore legs black to tips of fingers and webs. Tops of the fingers with seafoam yellow or deep colonial buff spots.

Narrow black bars across the dorsum of the femur, tibia and hind foot.



Rear of femur with white unconnected spots on a bone brown ground color. Rear edge of hind foot to tip of fourth and fifth toes black.

Iris: outside rim bright green-yellow; inner rim capucine orange; and interval black with orange rufous spots.

A younger specimen 65 mm. long is dark olive or deep olive on entire upper parts and very warty. Throat is deep grayish olive.

Two greenfrogs from the same place were: one, a female, dark olive buff uniform; and a smaller one wood brown to avellaneous uniform; back of eye and side of head and over angle of mouth apple green. Bars on hind legs absent in female, scanty in smaller specimens. Both with costal folds.

*Type*.—A male, 95 mm. long (C. U. No. 1025) taken August 18, 1922.

*Type locality*.—Alligator Swamp, Callahan, Florida.

*Known range*.—Coastal Georgia and Florida. From Savannah, Georgia, to Fargo (on Suwannee river) and Folkston (near St. Mary's river) in Georgia, all along the St. Mary's river on both Georgia and Florida sides and in Florida to Callahan.

*Habitat*.—It seems a frog of the swampy edges of rivers and streams,—a truly fluviatile species.

*Mature tadpole*.—Coloration in life. (July 21, 1922.) Body dark greenish olive or olive, finely covered with pale green-yellow or pale greenish-yellow flecks or spots on the dorsum. On venter they are vinaceous fawn, vinaceous cinnamon or orange vinaceous. Just back of angle of mouth in a mature tadpole and on the venter is a clump of 4 to 6 much larger spots. Lower belly pale forget-me-not blue to upper belly and breast jay-blue, Chapman's blue or grayish violaceous blue. Spots of back become thicker on lower belly and at times almost touch or make patches of color. Lateral line pores very prominent on the head and body.

Ventral half of muscular part of the tail light salmon orange or apricot buff or vinaceous cinnamon or ochraceous salmon. Upper half of the muscular part with a black band on caudal two-thirds and more or less merged into body color at its basal third. The black bandlike effect is produced by oblique bars of black where the myocommas are. These overshadow the intervening body color. Whole rim of tail or edge of crests black, least just in front of the vent.

Iris rim above and below orange cinnamon, tawny vinaceous, tawny or orange rufous or better vinaceous rufous. Iris rim in front and behind pupil black.

*Mature tadpole*.—General description. Tadpole quite large (95 mm.), usually black of body, and the most striking of all our (U. S.) *Rana* tadpoles. Belly pigmented so intestine does not show through in preserved specimens. Tail elongate, top acuminate; dorsal crest not as wide as musculature width; not much different from lower crest and not extending on body beyond the vertical through the buds of the hind limbs. Spiracle sinistral, just visible from dorsal aspect, divided backward and somewhat obliquely upwards. Spiracle usually with a distinct semicircular impression on body and opening. Opening, leaving exposed an elliptical or hemispherical patch on body. Spiracle clearly below lateral axis (mus-

culture axis). Eye on or just above lateral axis but in dorsal aspect nearer lateral outline than mid-dorsal axis. Anus dextral opening at edge of ventral crest.

Muciferous crypts distinct, white: a short dorsal row of a few pores on either side of middle line of the back from the dorsal crest forward; from above the middle line of insertion of tail musculature on body to a short distance behind eye a prominent dorsolateral row; apparently resumed behind eye after an interval, and continued as supraorbital and infraorbital lines to above and below the nostril; another lateral row from above insertion of hind legs to gill region where a ventral commissure goes across to the row of the other side. A third of the distance across the ventral branchial region a branch from the commissure goes outwards and forwards along the jaw region almost to the mouth.

*Mature tadpole.*—Mouth parts: Teeth  $\frac{2}{3}$  or  $\frac{3}{3}$ . Edge of upper labium greater than length of upper horny beak and fringed by a continuous row of teeth. Sometimes this fringe is broken up as in figure. In either corner, beneath this fringe is a short row of teeth about one-fourth to one-third of the length of the upper fringe. The outer end of this second row never reaches outward beyond the first fringe. Median space between these second row teeth, one to one and one-half times the length of either lateral series of the second row. In some median-sized tadpoles the space may be greater and the second row much shorter or rarely absent. The third upper row very short, frequently absent in young and medium-aged tadpoles. From above the end of the first upper labial row of teeth to beneath the end of the third lower labial row are two or three irregular rows of papillae which are continued across lower labium's edge as one serrate row. The third labial row longer than this single row of papillae equal to length of horny beak but  $\frac{1}{4}$ – $\frac{1}{5}$  shorter than first and second rows which extend beyond the ends of the horny beaks. The first row is continuous or broken in the middle.

*Mature tadpole.*—Measurements. Length of body (32.0–41.5 mm.) in tail (50–57.5 mm.) 1.4–1.85, average 1.625. Width of body (15.0–22.5 mm. in its own length 1.4–2.4 average 1.8. Depth (13–20 mm.) of body .9–1.6 in its own width, average 1.14, rarely greater than body. Depth of body 1.8–2.46 in body width, average 2.08. Depth of tail (14–18 mm.) of tail in length of tail 2.6–4.6, average 3.2. Depth of tail .8–1.3 in body depth, average 1.02. Muscular part (9–11 mm.) of tail in its own tail depth 1.45–2.0, average 1.72. Spiracle .86–1.2 nearer vent than snout, average 1.0 i. e. about equidistant in general; spiracle to snout (17–22 mm.) and spiracle to vent or base of hind legs (17–23 mm.). Spiracle to eye (8–12 mm.) in eye to snout (8–11 mm.) .85–1.2 average .99, i. e. eye to snout and spiracle to eye usually equidistant. Nostril to eye (4.0–6.0 mm.) equals the distance from nostril to snout (3.5–6.0 mm.). Mouth (3.0–7.0 mm.) usually 1.0–1.5 greater than the internasal space (3.0–6.5 mm.), average 1.2. Mouth contained 1.1–2.0 (average 1.46) in interorbital distance (5.0–10 mm.). Internasal space contained in interorbital space 1.4–2.0 average 1.75.

The dimensions of the largest tadpole are:

	mm.		mm.
Total length	95.0	Spiracle to vent	23.0
Body length	41.5	Spiracle to eye	11.5
Body depth	17.0	Eye to snout	10.0
Body width	17.0	Eye to nostril	6.0
Tail length	53.5	Nostril to snout	6.0
Tail depth	16.0	Mouth	6.5
Musculature of tail	11.0	Interorbital distance	10.0
Spiracle to snout	21.0	Internasal distance	5.0

*Measurements of adult frogs.*—We captured eight or ten specimens of this species but lost all but three male specimens of three different sizes, namely 56, 82 and 95 mm. respectively, from snout to vent.

In order to make the actual as well as derived relative measurements instantly show differences we compared 56 mm. male specimens of *R. virgatipes*, *R. septentrionalis*, *R. clamitans*, *R. grylio* (50, 51 mm.) *R. catesbeiana* (transforming and transformed). They were each the same size as our 56 mm. specimen of *R. heckscheri*. Likewise, with the 82 mm. specimen we compared males (82 mm.) of *R. clamitans*, *R. grylio* and *R. catesbeiana*. With the 95 mm. specimen, we compared similar-sized males of *R. clamitans*, *R. grylio* and *R. catesbeiana*. Finally, in the table are placed the measurements of a 136 mm. male of *R. catesbeiana*.

<i>Number</i> .....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Rana</i>																	
<i>Sex</i> .....	<i>virg.</i> ♂	<i>sept.</i> ♂	<i>clam.</i> ♂	<i>heck.</i> ♂	<i>gryl.</i> ♂	<i>gryl.</i> ♂	<i>cates.</i> <i>transfg.</i>	<i>cates.</i> <i>transfg.</i>	<i>clam.</i> ♂	<i>heck.</i> ♂	<i>gryl.</i> ♂	<i>cates.</i> ♂	<i>clam.</i> ♂	<i>heck.</i> ♂	<i>gryl.</i> ♂	<i>cates.</i> ♂	<i>cates.</i> ♂
Length (sn.-vent).....	56	56	56	56	50	51	56	56	82	82	82	82	95	95	95	95	136
Head (tymp. space).....	21	24	26	23	20	20	18	22	31	34	35	29	37.5	38	40	37	51
Head (angle mouth).....	15	19	19.5	20	18.5	19	16	20	25	29	29	27	31.5	35	35	34	49
Width of head.....	18	23	24	24	19	19.5	19	23	30	38	33	31	38	41	38	41	56
Snout.....	8	9	10	10	8	8	9	9	12	14	13	12	15	16	16	15	21
Eye.....	6.5	7	8	7	7	7	6	7	8	9	9	9	11	10	10	10	13
Interorbital space.....	2	3	3.5	3	3	3	5	4	5	7	5	6	5	9	7	6	6
Upper eyelid width.....	4.5	6	5.5	6	4	3.5	4.5	4.5	7	8	6	5	8	7.5	6	7	11
Tympanum.....	7	10	9	5	5	6	4	5	13	12	13	7	14	13	16	11	18
Intertympanic width.....	12.5	11	12	15.5	12	10	15	15	17	18	15.5	19	17.5	21	15	21	28
Internasal space.....	4.5	4	6	5.5	4.5	4	6	6	7	7	7	7	7	7	7	7	10
Forelimb.....	23	30	31	29	29	30	33	31	41	35	50	38	54	47	51	50	66
1st finger.....	7	7	9	9	8	9	10	10	12	12	14	13	15	13	15	17	20
2d finger.....	7	9	8	7.5	9	10	10	10	11	11	16	13	14	12	16	16	19
3d finger.....	9	10.5	12	10	11.5	12	12	12	16	13	18	18	19	16	20	20	26
4th finger.....	6	9	7	7	7	9	10	10	11	10	12	12	15	11	16	15	20
Hind limb.....	75	88	86	84	75	77	75	82	111	119	128	107	146	133	144	130	190
Tibia.....	23	29	31	29	25	25	24	28	41	41	42	37	50	45	46	45	66
Foot.....	25	32	33	30	26	27	27	28	37	43	48	40	48	48	49	50	96
1st toe.....	7	7	8	8	8.5	9	8	9	10	11	15	12	11	13	17	15	15
2d toe.....	13	13	12	12	14	13	13	13	18	18	24	18	19	21	25	23	28
3d toe.....	18	20	18	17	18	19	18	18	22	23	29	26	27	25	34	31	41
4th toe.....	24	28	30	27	25	23	25	27	35	38	44	36	43	42	45	46	60
5th toe.....	16	19	20.5	18	19	19	20	20	27	28	35	30	29	30	37	35	42



*Rana heckscheri*.—Head to angle of mouth 1.2 (56 mm.)–1.31(82 mm.)–1.17(95 mm.) in width of head; head to rear of tympanum 1.04–1.11–1.08 in width of head; head to angle of mouth 2.8–2.82–2.71 in length of body; head to rear of tympanum 2.43–2.41–2.5 in length of body; snout .9–.71–.69 in fourth finger; snout .8–.78–.81 in first toe; eye 1.43–1.55–1.6 in snout; eye .70–1.3–1.3 in tympanum; eye 1.3–1.33–1.3 in first finger; tympanum 3.1–1.5–1.61 in intertympanic width; tympanum 2.0–1.16–1.23 in snout; internasal width 1.08–1.43–1.07 in upper eyelid width; interorbital width 2.0–1.14–.83 in upper eyelid width; interorbital width 1.83–1.0–.77 in internasal width; interorbital width 5.16–2.57–2.33 in intertympanic width.

Forelimb: 1.93–2.34–2.0 in length (snout to vent); forelimb 2.9–3.4–2.83 in hind limb; first finger 1.11–1.08–1.23 in third finger; second finger 1.375–1.18–1.09–1.08 in first finger; third finger 1.2–1.36–1.3 in second toe; fourth finger 1.14–1.1–1.18 in first toe; fourth finger 1.42–1.1–1.45 in third finger; internasal width 1.63–1.71–1.85 in first finger; 1.36–1.57–1.71 in second finger; 1.8–1.85–2.3 in third finger; 1.27–1.43–1.57 in fourth finger.

Hindlimb: length 1.5–1.45–1.4 in hind limb; tibia 1.93–2.0–2.11 in length; tibia 2.89–2.9–2.95 in hind limb; tibia 1.0–.853–1.04 in forelimb; tibia 1.03–1.04–1.06 in hind foot; first toe 1.5–1.63–1.61 in second toe; 1.87–2.72–1.84 in third toe; 3.37–3.45–3.23 in fourth toe; 2.25–2.63–2.3 in fifth toe; second toe 1.41–1.61–1.14 in third toe; 2.25–2.11–2.0 in fourth toe; 1.5–1.55–1.42 in fifth toe; third toe 1.59–1.31–1.75 in fourth toe; 1.06–.96–1.25 in fifth toe; fourth toe 1.11–1.13–1.14 in hind foot; 1.07–1.07–1.07 in tibia; 1.07–.92–1.12 in forelimb; fifth toe 1.5–1.35–1.4 in fourth toe; internasal width 1.45–1.57–1.85 in first toe; 2.18–2.57–3.0 in second toe; 3.08–4.14–3.43 in third toe; 4.9–5.43–6.0 in fourth toe; 3.2–4.0–4.3 in fifth toe.

*Rana catesbeiana*.—Head to angle of mouth, 1.18 (56 mm. transforming)–1.15 (56 mm. transformed)–1.14 (82 mm.)–1.2 (95 mm.)–1.14 (136 mm.) in width of head; head to rear of tympanum 1.05–1.04–1.06–1.10–1.1 in width of head; head to angle of mouth 3.5–2.8–3.03–2.82–2.77 in length (snout to vent); head to rear of tympanum 3.1–2.54–2.82–2.57–2.66 in length; snout 1.11–1.11–1.0–1.0–1.0 in fourth finger; snout .88–1.0–1.0–1.0–.71 in first toe; snout 1.11–1.11–1.08–1.13–1.1 in first finger; eye 1.5–1.3–1.33–1.5–1.72 in snout; .66–.70–.77–1.1–1.38 in tympanum; tympanum 3.75–3.0–2.71–1.9–1.55 in intertympanic width; 2.25–1.8–1.71–1.36–1.16 in snout; internasal width .75–.75–.71–1.0–1.1 in upper eyelid width; interorbital width .9–1.11–.83–1.16–1.8 in upper eyelid width; 1.2–1.5–1.16–1.16–1.66 in internasal width; 3.0–3.75–3.16–3.5–4.66 in intertympanic width.

Forelimb: 1.7–1.8–2.15–1.9–2.06 in length; 2.2–2.6–2.81–2.6–2.88 in hind limb; first finger 1.2–1.2–1.36–1.17–1.3 in third finger; second finger 1.2–1.2–1.36–1.25–1.36 in third finger; .80–.90–1.0–1.06–1.05 in first finger; third finger 1.08–1.08–1.0–1.15–1.76 in second toe; fourth finger .8–.9–1.0–1.13–.75 in first toe; 1.2–1.2–1.08–1.33–1.3 in third finger; internasal width 1.66–1.66–1.85–2.43–2.6 in first finger; 1.66–1.66–1.85–2.3–1.9 in second finger; 2.0–2.0–2.57–2.85–2.6 in third finger; 1.66–1.66–1.71–2.14–2.0 in fourth finger.

Hindlimb: length 1.34–1.46–1.30–1.36–1.4 in hind limb; tibia 2.33–2.0–

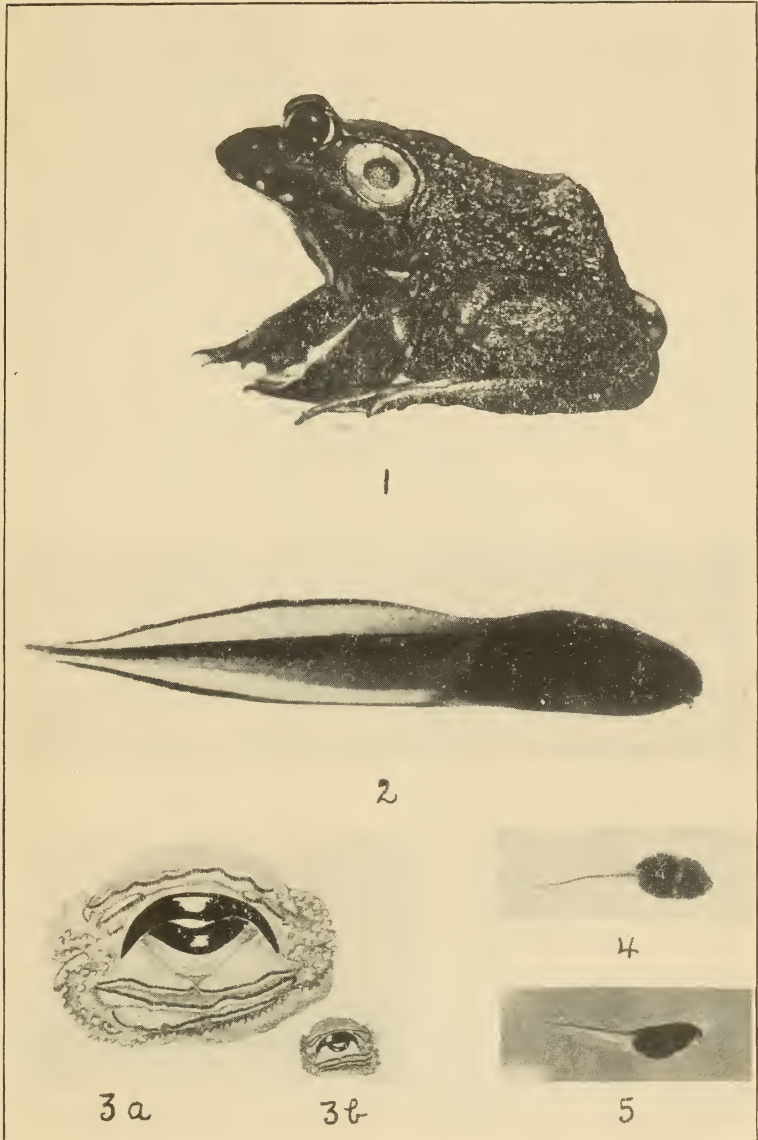
2.21-2.11-2.06 in length; 3.12-2.92-3.04-2.88-2.87 in hind limb; 1.37-1.10-1.03-1.11-1.0 in forelimb; 1.12-1.0-1.08-1.11-1.45 in hind foot; first toe 1.62-1.44-1.5-1.53-1.86 in second toe; 2.25-2.0-2.16-2.06-2.7 in third toe; 3.12-3.0-3.0-3.06-4.0 in fourth toe; 2.5-2.22-2.5-2.33-2.8 in fifth toe; second toe 1.38-1.38-1.44-1.35-1.47 in third toe; 1.88-2.7-2.0-2.0-2.14 in fourth toe; 1.53-1.53-1.66-1.56-1.5 in fifth toe; third toe 1.39-1.5-1.38-1.48-1.46 in fourth toe; 1.11-1.11-1.15-1.12-1.02 in fifth toe; fourth toe 1.08-1.03-1.11-1.09-1.06 in hind foot; .96-1.03-1.02-.98-1.1 in tibia; 1.32-1.14-1.05-1.08-1.1 in forelimb; fifth toe 1.25-1.35-1.2-1.31-1.42 in fourth toe; internasal width 1.33-1.5-1.71-2.14-1.5 in first toe; 2.16-2.16-2.57-3.3-2.8 in second toe; 3.0-3.0-3.71-4.43-4.1 in third toe; 4.16-4.5-5.14-6.57-6.0 in fourth toe; 3.33-3.33-4.3-5.0-4.2 in fifth toe.

*Rana clamitans*.—Head to angle of mouth 1.24-1.2-1.2 in width of head; head to rear of tympanum .92-.967-1.01 in width of head; head to angle of mouth 2.82-3.28-3.05 in length (snout to vent); head to rear of tympanum 2.15-2.64-2.53 in length; snout .9-.916-1.0 in fourth finger; snout .8-.83-.73 in first toe; eye 1.25-1.5-1.36 in snout; eye 1.12-1.62-1.27 in tympanum; eye 1.12-1.5-1.36 in first finger; tympanum 1.33-1.3-1.25 in intertympanic width; tympanum 1.11-.92-1.07 in snout; internasal width .91-1.0-1.14 in upper eyelid width; interorbital width 1.67-1.40-1.6 in upper eyelid width; 1.71-1.4-1.4 in internasal width; 3.4-3.4-3.5 in intertympanic width.

Forelimb 1.8-2.0-1.75 in length; 2.77-2.7-2.71 in hind limb; first finger 1.33-1.33-1.26 in third finger; second finger 1.5-1.45-1.35 in third finger; 1.0-1.09-1.07 in first finger; third finger 1.0-1.12-1.0 in second toe; fourth finger 1.14-.91-1.0 in first toe; 1.7-1.45-1.26 in third finger; internasal width 1.5-1.71-2.14 in first finger; 1.25-1.57-2.0 in second finger; 2.0-2.3-2.7 in third finger; 1.16-1.57-2.14 in fourth finger.

Hind limb: length 1.53-1.33-1.53 in hind limb; tibia 1.86-2.0-1.9 in length; 2.77-2.7-2.92 in hind limb; 1.0-1.0-1.08 in forelimb; 1.64-.902-.96 in hind foot; first toe 1.5-1.8-1.72 in second toe; 2.25-2.2-2.54 in third toe; 3.75-3.5-3.91 in fourth toe; 2.56-2.7-2.72 in fifth toe; second toe 1.5-1.22-1.42 in third toe; 2.5-1.94-2.26 in fourth toe; 1.70-1.22-1.52 in fifth toe; third toe 1.66-1.59-1.59 in fourth toe; 1.14-1.22-1.07 in fifth toe; fourth toe 1.1-1.05-1.11 in hind foot; 1.03-1.17-1.16 in tibia; 1.03-1.17-1.25 in forelimb; fifth toe 1.46-1.3-1.48 in fourth toe; internasal width 1.33-1.42-1.57 in first toe; 2.0-2.57-2.7 in second toe; 3.0-3.14-3.85 in third toe; 5.0-5.0-6.14 in fourth toe; 3.4-3.85-4.14 in fifth toe.

*Rana grylio*.—Head to angle of mouth 1.02(50 mm.)-1.02(51 mm.)-1.13(82 mm.)-1.08(95 mm.) in width of head; head to rear of tympanum .95-.975-.94-.95 in width of head; head to angle of mouth 3.37-2.68-2.82-2.71 in length; head to rear of tympanum 2.8-2.55-2.34-2.375 in length; snout 1.0-1.12-.92-1.0 in fourth finger; 1.06-1.12-1.15-1.06 in first toe; eye 1.14-1.14-1.44-1.6 in snout; eye .70-.85-1.44-1.6 in tympanum; eye 1.14-1.29-1.55-1.5 in first finger; tympanum 2.4-1.66-1.2-.93 in intertympanic width; 1.6-1.33-1.0-1.0 in snout; internasal width .88-.875-.857-.85 in upper eyelid width; interorbital width 1.33-1.16-1.2-.86 in upper eyelid width; 1.5-1.33-1.4-1.0 in internasal width; 4.0-3.33-3.1-2.14 in intertympanic width.



*Rana heckscheri.*

